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# INITIAL PLAN NONGAME & ENDANGERED SPECIES PROGRAM

MASSACHUSETTS DIVISION OF  
FISHERIES & WILDLIFE


UMASS/AMHERST



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Massachusetts Division of Fisheries & Wildlife



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Initial Plan

Nongame and Endangered Species Program  
Massachusetts Division of Fisheries and Wildlife

Prepared by the

Nongame Advisory Committee

Gwilym S. Jones, Chairman and Editor

14 June 1984

Approved by the Massachusetts  
Fisheries and Wildlife Board

21 February 1985





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In response to a request from the Chairman, nongame personnel in the following states sent materials describing their programs which were useful in formulating this proposal: AL, AK, AZ, AR, CO, CT, DE, FL, GA, ID, IL, IN, IA, KS, ME, MD, MI, MN, MS, MO, MT, NH, NJ, NY, NC, ND, OH, OK, OR, PA, SC, TN, TX, VT, VA, WV, WI, WY.

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## PREFACE

This document has been prepared by the Nongame Advisory Committee under the mandate of the Commissioner of the Department of Fisheries, Wildlife, and Recreational Vehicles. It is essentially the first year's plan but the Committee has also presented supporting information with the intent of defining the program. This is a public document.

Although funding through the Nongame Checkoff is exceeding expectations at the time this is written, the financial status, predictably, will not be known until July 1984 when processing of the State tax forms is completed. Therefore the plan proposed here is what the Committee considers an ideal under sufficient funding. Priorities have been proposed in case of less than sufficient funding.

## GENERAL STATEMENT

Increasing encroachment into wildlife habitats by economic and public development make it imperative that the status of nongame wildlife species and their habitats be determined and that, where necessary, management practices be instituted in order to maintain or enhance their status. Most is known about highly visible species and the least about cryptic species such as the water shrew and many invertebrates.

## BASIC PREMISES

Preservation of nongame wildlife is most dependent upon conservation of habitat. Therefore, in order to be effective, the Nongame Program must study and maintain communities as well as individual species. Without extensive knowledge of the species

within the community, the effects of disturbances upon it cannot be fully understood. The program's success will be dependent upon knowledge--"gained, used, and disseminated."

#### LEGAL DEFINITION AND RESPONSIBILITY

On 26 July 1983, Governor Dukakis signed Chapter 330 of the Acts of 1983--"An Act Relative to Funding for Nongame Wildlife Programs in the Commonwealth." Chapter 330 includes the following definition: "Nongame wildlife, any nondomesticated animal not regulated by the Division as a game species and any plant, native to the Commonwealth, which is not classified as domesticated." This includes 85% of the vertebrate wildlife in Massachusetts and most invertebrates and plants. The authority with responsibility for Nongame Wildlife is the Division of Fisheries and Wildlife.

#### DEFINITIONS (some presently under review)

Community - An assemblage of organisms that live in a self-sustaining, self-regulating association.

Division. Massachusetts Division of Fisheries and Wildlife

Element. Species or Natural Community

Endangered Species. Any species which is in danger of extinction through all or a significant portion of its range. Species listed under provisions of the Federal Endangered Species Act of 1973 (Code of Federal Regulations, Title 50, Sections 17.11 and 17.12) which occur in Massachusetts are included, as well as species which the Division of Fisheries and Wildlife has recommended to the United States Fish and Wildlife Service should be so listed.

Exotic Species. Any species not occurring naturally in the Commonwealth.

Exempt Species. Any vertebrate species which may be imported or possessed without a license (as listed at 321 CMR 9.01 pursuant to Section 23 of Chapter 131, Massachusetts General Laws).

Management. The collection and application of biological information for the purpose of obtaining optimum levels of wildlife within an ecosystem and maintaining those levels. The term includes, but is not limited to, research, census, law enforcement, habitat acquisition, preservation and maintenance, propagation, live trapping and transplantation, education and other activities effective in encouraging better conservation of wildlife in the Commonwealth. This term also includes, when and where appropriate, the periodic or total protection of a species or population, as well as regulated taking.

Nongame Program. Nongame and Endangered Species Program

Peripheral Species. An animal or plant that reproduces occasionally or reaches the edge of its range in the Commonwealth.

Species for Special Consideration. Species determined to be Endangered, Threatened, State Rare, State Local, Peripheral in Massachusetts.

State Local Species. Long-established or seasonally recurring species in the Commonwealth that are restricted to very limited areas. Also included in the term are (1) a few breeding species that are somewhat more widespread but nowhere frequent and generally restricted to very specialized habitats, and (2) migratory species restricted to limited specific habitats within the Commonwealth which play a vital role in the survival of the species.



State Rare Species. Long-established or seasonally occurring species whose populations are either documented to be declining or known to survive in critically low numbers.

Threatened Species. Any species which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Species listed under provisions of the Federal Endangered Species Act of 1973 (Code of Federal Regulations, Title 50, Sections 17.11 and 17.12) which occur in Massachusetts are included, as well as species which the Division of Fisheries and Wildlife has recommended to the United States Fish and Wildlife Service should be so listed.

#### DEMANDS AND VALUES

Each nongame wildlife species has a function in its community as well as its own intrinsic, aesthetic, recreational, and scientific values.

Nongame species also serve as indicators of environmental quality--an index of their own well-being, and that of associated plant and animal species including mankind. This is particularly evident with regard to the effects of acid rain and pollution of aquatic ecosystems.

The citizenry of the Commonwealth experience Nongame Wildlife through a broad spectrum of activities including observation, feeding, rehabilitation, photography, bird banding, collecting for scientific and educational purposes, and falconry. According to a 1980 nationwide survey conducted by the US Fish and Wildlife Service, 93.2 million Americans of the age of 16 years or older (= 55% of the population) participated in "nonconsumptive activities." The beneficiaries of these activities are both the people and the wildlife.

## FUNDING

Chapter 330 "established and set up on the books of the Commonwealth a separate fund to be known as the Nongame Wildlife Fund . . . ." It further provides for an income tax checkoff which allows a voluntary contribution of any part or all of one's refund. Such monies and other contributions meant for nongame must be deposited, by law, in the Nongame Wildlife Fund. The act states that the Fund is to be used for - 1) acquisition of lands critical to the protection and enhancement of nongame wildlife and endangered species, 2) inventory and management (i.e. preservation, protection, perpetuation, enhancement) of Nongame Wildlife, and 3) fund the Natural Heritage Program's inventory of rare and endangered species and communities.

In addition to monies acquired through the checkoff, donations can be deposited directly into the Nongame Wildlife Fund. Further, there are federal sources of funds for such projects as endangered species. Historically, funding of the program was derived from these federal funds, state fishing and hunting licenses and general public revenues.

## BACKGROUND

Massachusetts' Nongame and Endangered Species Program was initiated by Chapter 129 of the Resolves of 1973 and the Division established the position of Assistant Director for Nongame and Endangered Species in 1977. In addition, part-time responsibilities of one Game Biologist and one Fisheries Biologist were assigned to this program. An "ad hoc" Nongame Advisory Committee was appointed in 1981.

In addition to establishing a definition of Nongame Wildlife and establishing the Fund, Chapter 330 directed the Commissioner of the

Department of Fisheries, Wildlife and Recreational Vehicles to appoint a Nongame Advisory Committee, subject to approval by the Fisheries and Wildlife Board. As defined by the Act, the Committee is composed of 7 members--1 board member, 3 with technical training and experience in mammalogy, ornithology, herpetology, ichthyology or botany, and 3 with knowledge in the field of natural history. The Committee is to advise the Board on matters pertinent to Nongame Wildlife, including plants. This Committee was sworn in during December 1983. The Commissioner further appointed 8 associate members; represented in this group were The Nature Conservancy, Massachusetts Wildlife Federation, Massachusetts Audubon Society, Defenders of Wildlife, Massachusetts Association of Conservation Commissions, and the Sierra Club. Concurrent with the signing of the Act, the Massachusetts Natural Heritage Program's contract was shifted from the Department of Environmental Management to the Division of Fisheries and Wildlife. Further, during March 1984, the vacant position of State Ornithologist was filled.

Thus the staff of the Nongame Program currently consists of the Assistant Director, State Ornithologist and the Natural Heritage staff. In addition a Game Biologist, Fisheries Biologist and Conservation Helper are each assigned to the program part-time. In addition, a temporary position was established in the Information and Education Section to promote and oversee the Nongame Wildlife Fund.



Functioning in concert with the state's Nongame Program are a variety of federal laws--

- Migratory Bird Treaty Act 1918
- Migratory Bird Conservation Act 1929
- Fish and Wildlife Coordination Act 1934
- Federal Aid to Wildlife Restoration Act 1937
- Bald Eagle Protection Act 1940
- Endangered Species Preservation Act 1966
- Endangered Species Conservation Act 1969
- National Environmental Policy Act 1970
- Marine Mammal Protection Act 1972
- National Endangered Species Act 1973
- Comprehensive Fish and Wildlife Management Act
- National Forest Resources Act
- Fish and Wildlife Conservation Act 1980

#### PROGRAM GOAL

- \*To maintain the diversity and abundance of nongame wildlife species and natural communities for their functional, intrinsic, aesthetic, recreational, and scientific values by establishing and developing the Nongame and Endangered Species Program under the direction and funding provided in Chapter 330 of the Acts of 1983.

#### PROGRAM OBJECTIVES

- \*To determine distribution, abundance and habitat requirements of Nongame Species and to provide for continued monitoring of their status. Particular emphasis should be placed on Species and Communities for Special Consideration
- \*To prevent further decline of species which are threatened or endangered by preparing and implementing recovery plans for those species
- \*To increase, restore and maintain habitats necessary to conserve the abundance and diversity of Nongame Wildlife in Massachusetts

- \*To acquire and otherwise protect lands containing habitats beneficial to Nongame Wildlife in an effort to maintain habitat diversity
- \*To provide information for and participate in environmental impact reviews (e.g. MEPA).
- \*To evaluate proposed actions which may potentially impact nongame species
- \*To promote public understanding and appreciation of nongame wildlife species and their habitats and to insure public participation in the Nongame Program
- \*To provide information and education relative to Nongame Wildlife and the Nongame and Endangered Species Program
- \*To control the legal use of Nongame Species for scientific, educational, and other legitimate purposes.

#### PRIORITIES

Ideally, all of the general goals and those listed in each section should be carried out concomitantly. Pragmatically, however, the highest priorities must be given to current programs dealing with Species and Communities for Special Consideration and inventories.

In addition the following are considered of high priority during the first year:

- \*Species and communities on sites threatened by "human-induced" change
- \*Evaluations of nongame associated legislation and regulations
- \*Full integration of the Natural Heritage Program into the Nongame and Endangered Species Program



- Increased public awareness of the Nongame Program and Nongame Wildlife Fund through the Information and Education Section
  - Maintenance of research and inventory efforts
  - Initiation of the authorization process for acquisition of rare and endangered species' habitats with the four million dollars appropriated for this purpose by the Legislature in the Capital Outlay Budget of 1983
- 

## I. Administration

Within the next three years the potential for a full scale Nongame Program should become apparent and inventory work should be sufficiently advanced to begin defining the criteria to be used in prioritizing the Program's land acquisition and research needs. It should be known what new land acquisitions will be necessary in order to protect the state's natural diversity. Strategies will have to be developed for accommodating research at various levels, both by staff and other scientists.

Recommendation: The Assistant Director should develop a long range master plan for the efficient utilization of program resources in a balanced approach to the most pressing problems of nongame and endangered species.

### General

Goal: To incorporate the Natural Heritage Program into the Division

The current inventory data base is the product of the Commonwealth's Natural Heritage Program. Since this activity is the mainstay of sound management of nongame resources, it can be argued that the NHP should be fully assimilated into the Nongame Program. However, uncertainties regarding continuation of the NHP as a line item in the Commonwealth's budget and questions concerning the advisability of converting NHP staff to permanent positions within the Division, preclude the formulation of specific recommendations on this issue at this time. For efficient function of the Nongame Program, this issue must be resolved immediately. The current difficulty in resolving the matter of office space for the NHP staff is symptomatic of this problem.

#### Recommendations:

- At the earliest possible time the Assistant Director should work with the Director, and if necessary the Commissioner, to seek a resolution regarding the NHP/Nongame Program relationship.
- The Division should consider changing the title from Natural Heritage Program to Natural Heritage Inventory.

Goal: To include the public in Nongame Program Development.

Because the citizens of the Commonwealth directly fund most of the Nongame Program, their understanding and participation in the Program is essential.

Recommendation:

Under the guidelines of Chapter 330, the Commissioner should maintain a broad representation of the Commonwealth's citizenry on the Nongame Advisory Committee and an equally representative cross-section among the associate members.

Personnel

Goal: To staff the Nongame Program with sufficient personnel to meet Program requirements.

Given the certainty that the funds of the Nongame Program will increase as a result of the income tax check-off, the administrative needs of this program are likely to change rapidly within the next few years. Hence, at this time it is difficult to recommend a definitive administrative structure for the staff of the Nongame Program. The needs of the Program with regard to size and expertise of its staff, the status and source of funding for the NHP and strategies for attaining a proper balance among the diverse responsibilities within the purview of the Nongame Program are bound to evolve in ways that cannot be easily predicted at this time. It is, therefore, important that the administrative structure be flexible enough to respond to the evolving needs of the Nongame Program.

Presently the Nongame Program staff consists of the Assistant Director and State Ornithologist plus a

contracted Information Specialist and a part-time Game Biologist, Fisheries Biologist, Wildlife Journalist and Skilled Conservation Helper. The contracted NHP staff consists of the Coordinator/Ecologist, Zoologist, part-time Botanist, part-time Environmental Review Specialist/Data Manager, and short-term Data Handler.

#### Recommendations:

- \*The Nongame Program should be provided with a full-time Information Specialist whose responsibility would be to inform and educate the public.
- \*The NHP should be provided with a full-time Data Processor in order to facilitate the assimilation and retrieval of inventory data.
- \*The Assistant Director should determine what staff will be required to accomplish priority projects: only then can further staffing needs be considered.

#### Office Facilities

Goal: To establish reasonably secure facilities for the Nongame Program

Program personnel are presently housed in 2 locations-- the Assistant Director, NHP staff, and I & E specialist at the Saltonstall Building, Boston and the State Ornithologist at the Field Headquarters, Westboro.



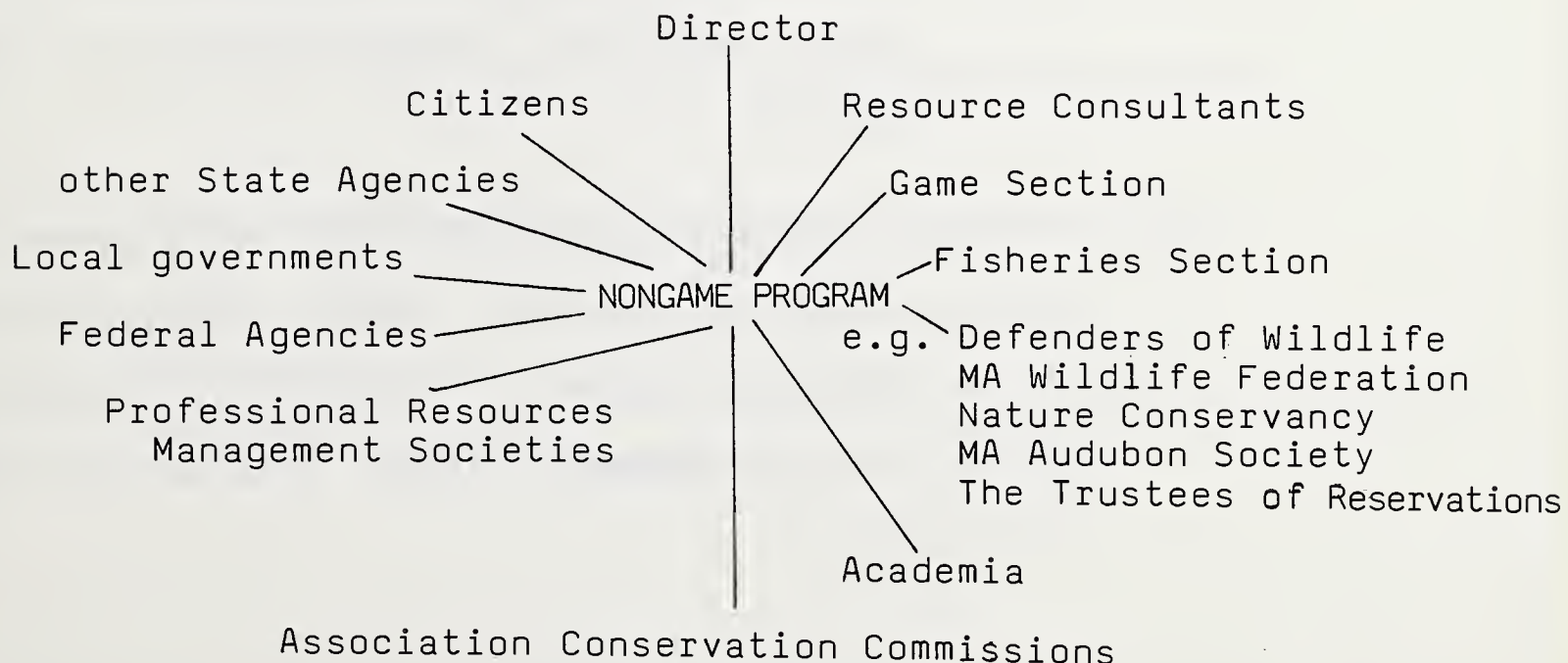
### Recommendations:

- For reasons expanded upon in later sections of this proposal, the NHP should remain in Boston.
- For the purposes of data handling and report writing word processing facilities should be developed.

### Intra-and Interagency Cooperation

- Goals:
- To integrate the Nongame Program with other Division programs
  - To establish cooperation and interaction with other departments, divisions, bureaus and sections within the government of the Commonwealth and with federal, local and other states' governments.
  - To establish cooperation and interaction with non-governmental organizations and academic institutions.

The following diagram illustrates some of the agencies, organizations and institutions with which the program interacts:





#### Recommendations:

- \*The Program should continue productive relationships with such agencies, organizations, and institutions
- \*The Assistant Director should establish a communications network among the above and other such agencies, organizations and institutions

#### Legislation and Regulations

A variety of legislative acts and regulations are involved with Nongame Wildlife. Included are the Code of Massachusetts Regulations and Chapter 131 of the Massachusetts General Laws.

#### Recommendation:

- \*All legislation and regulations involving Nongame Wildlife, including exotic species, should be reviewed and revisions be considered.

#### Permits

Goal: To regulate, through permits, the taking, possession and transportation of nongame wildlife for scientific study, education, rehabilitation, and other such purposes.

The Division regulates the following permits which involve Nongame Wildlife: Salvage, Rehabilitation, Raptor-salvage, Falconry, Propagation, Bird-Banding, and Collecting (Mammals, Birds, Reptiles and Amphibians, and Fishes).

Presently, this system is inefficient. Delays technically halt any rehabilitation efforts, bird-banding and collecting. The latter two are necessary for inventory and scientific studies, including graduate student research.

Recommendation:

- \*The permit review process should be streamlined and permits distributed promptly.

Budget

The following is a summary of the budget request for FY 1985:

- \*Staff Salaries
- \*Contract Services, including Natural Heritage Program, Plymouth red-bellied turtle research, and office cleaning services.
- \*Clothing, for field work
- \*Housekeeping supplies (portion of)
- \*Plant Operations, at Westboro (portion of fuel oil and electricity)
- \*Travel, of personnel and Nongame Advisory Committee (as provided for in Chapter 330)
- \*Printing and Advertising
- \*Repairs and Renovations, of equipment and office space
- \*Special Equipment and Supplies, including books for library
- \*Operating Costs, including shipping, postage, duplicating and telephone expenses

- \*Equipment, including a vehicle and typewriter

- \*Rentals, of vehicles

- \*Capital Outlay, for land acquisition

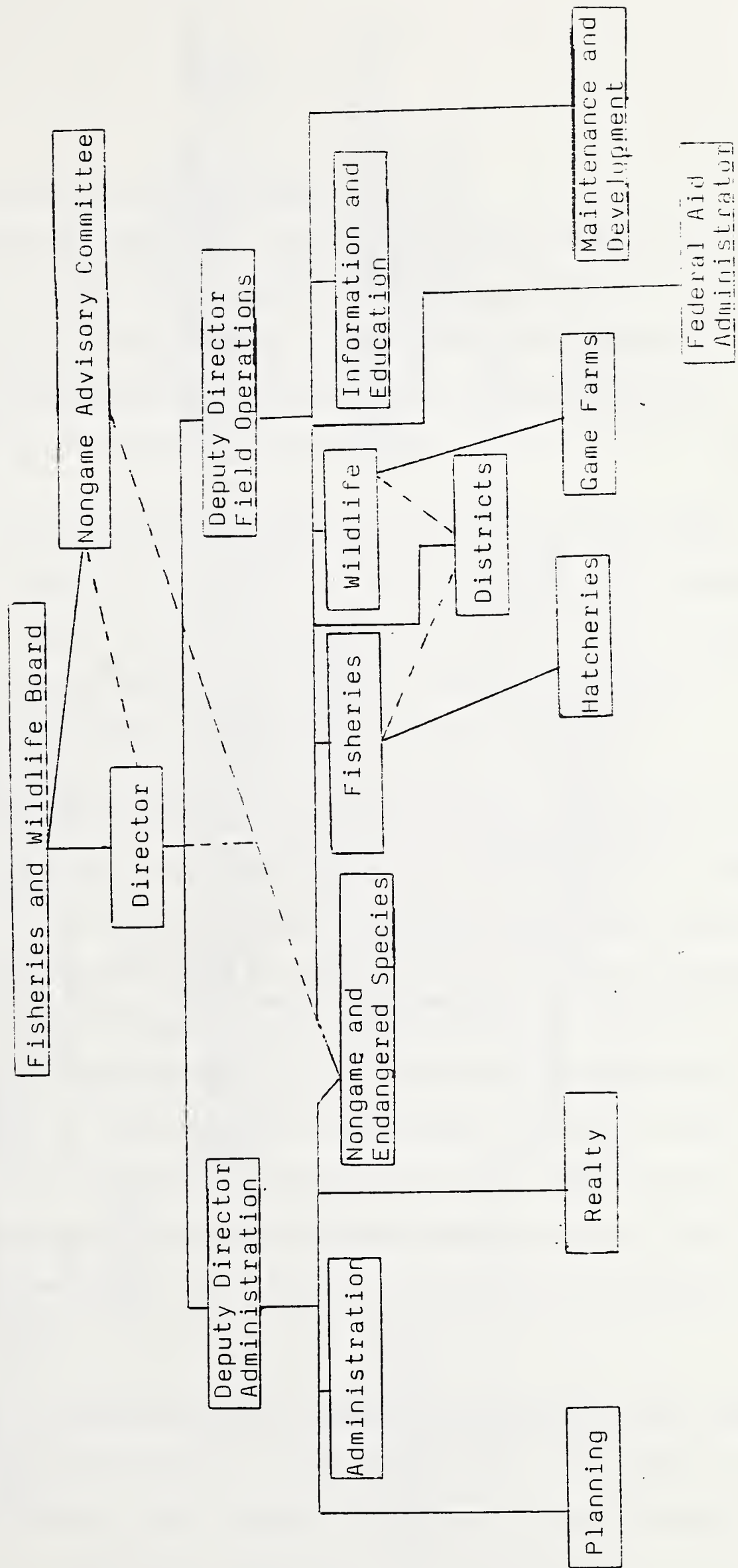
The grand total of the request is \$407, 436.00

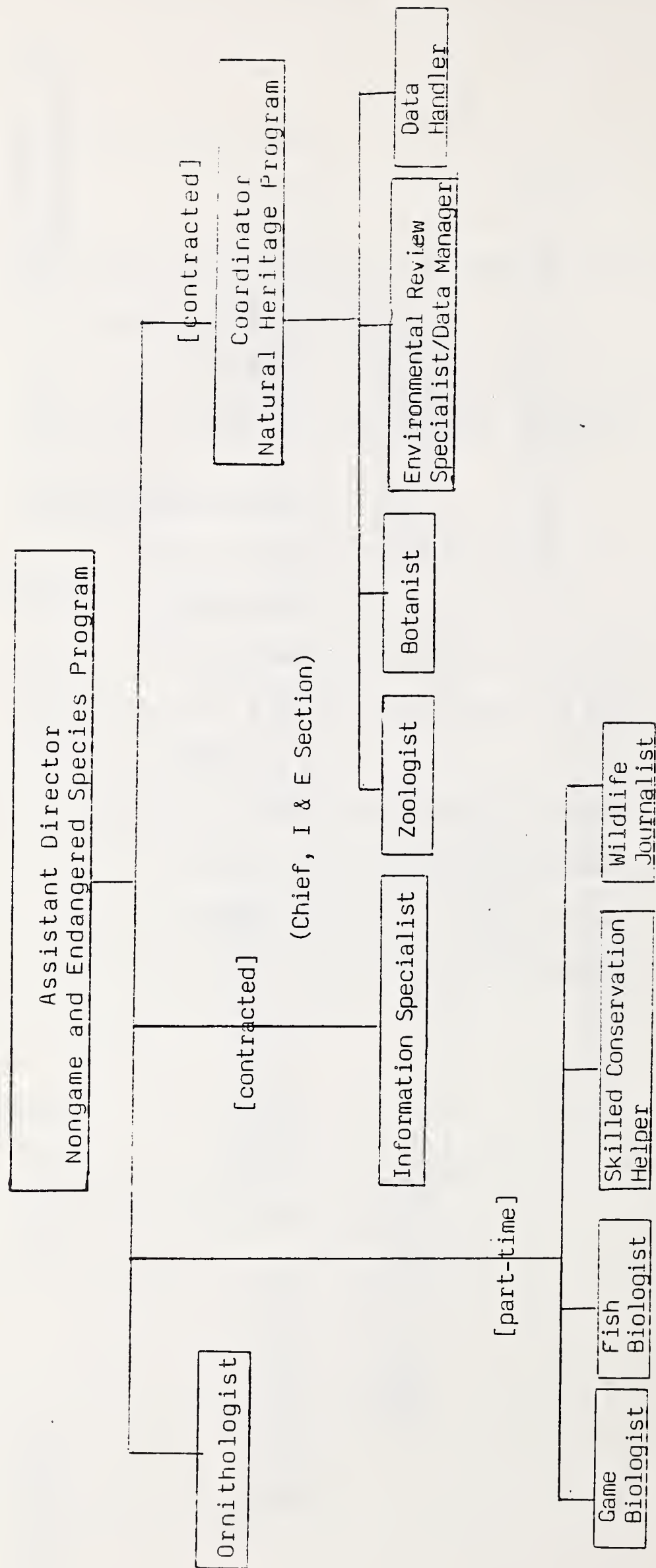
Recommendations:

- \*The costs of each aspect of the program which is proposed in this Initial Plan should be determined and, if need be, program priorities should be altered based on available funding and need.

- \*There should be continued support for inventory because up-to-date environmental reviews and regular reviews of the status of rare species are required for sound management.

Figure 1. Division of Fisheries and Wildlife Organizational Chart







## II. Priority Research and Management

Nongame and endangered species can only be effectively conserved if their distribution, abundance, and environmental requirements are documented. Conservation of communities and/or species so documented may include protection, including acquisition and management of land.

Goal: To obtain data necessary to protect and manage  
Species and Communities for Special Consideration,  
and Division properties so as to preserve and,  
where possible, increase the diversity and  
abundance of native wildlife and plants

Most nongame activities of the Division have been in the area of inventory or management rather than research. With the transfer of the Natural Heritage Program (NHP) from the Department of Environmental Management (DEM) to the Division's Nongame Program, the most comprehensive inventory of communities and species ever developed within the Commonwealth has become an integral part of the Program's resources. Inventory work must continue to be of higher priority than most other Nongame projects because adequate distribution and abundance data are required to provide the basis for determining research and management needs and priorities.

### Criteria for Determination of Needs and Allocation of Funds:

The Nature Conservancy's global and state rankings for  
"rare species and natural communities", which take into  
account scarcity, uniqueness and vulnerability

- Availability of funds for specific species or communities, (e.g., Section 6 monies for work with federally listed species)
- The element of opportunity should not be ignored, i.e., proposals which may not meet the above criteria should not be disregarded if they have intrinsic merit, are cost-effective, and warrant immediate funding (e.g., someone with suitable expertise is available to conduct a specialized research project)

#### Management Plans

Management plans have been developed for the following species:  
Plymouth red-bellied turtle, Osprey, Peregrine, Bald eagle, Purple martin, Indiana bat.

#### Personnel for Accomplishing Needs include:

- Division personnel, particularly but not limited to personnel of the Nongame Program
- Temporary assistants, including seasonal and work study students working under the direction of Nongame Program personnel
- Independent investigators operating under Small Contracts
- Principal investigators working on high priority needs via a limited number of Major Contracts
- Volunteers

## RECOMMENDATIONS

### Avoidance of Duplication

In order to avoid duplication, it is recommended that the Assistant Director determine the relationship of Nongame Program research goals and objectives to research projects which are underway or are being developed by research organizations and academic institutions.

### Personnel

It will be necessary to identify which Nongame projects can be most efficiently accomplished by permanent Program personnel, which by temporary field assistants, and which can be better accomplished under contract. NHP should continue to maintain and update its file of individuals and organizations with inventory and research expertise.

### Long-term Projects

Research projects which require long-term financial commitments need to be identified. Consideration should be given to funding them externally through research organizations and academic institutions.

### Scientific Review

It is recommended that, in addition to his own and his staff's review, the Assistant Director take advantage of the scientific expertise of the members and associate members of the Nongame Advisory Committee by asking them, when necessary, to review research priorities, requests for proposals (RFP), and proposals received.

### First-Year Priorities

Current projects of the Nongame Program are presented in APPENDIX A and a list of research and inventory priorities prepared by the staff of the Natural Heritage Program (NHP) are presented in APPENDIX B. The items are not listed according to priority; the need and value of projects listed in both appendices are recognized. Obviously, priorities must be determined since not all projects can be accomplished during the first year of this expanded program. Current nongame projects should receive careful and immediate review by the Assistant Director and the Nongame staff in order to determine priorities. This review should include projects beyond those listed in Appendices A and B (i.e., consideration should also be given to other topics which may be suggested by knowledgeable individuals and/or organizations). Other possible projects are:

- \*Pitch Pine/Scrub Oak Barrens are a natural community of limited distribution and unusual structure as well as providing habitat for many Species Listed for Special Consideration. Therefore, this community should be considered for further inventory and since Pine Barrens need active management, appropriate management should be considered.
- \*A complete survey of potential bat hibernacula is needed in order to determine the status of the Indiana myotis in the Commonwealth. This species is federally endangered.



Survey of unionid molluscs (freshwater clams), which are susceptible to habitat degradation, should be expanded and a survey made of historic localities for regionally and nationally rare species. At least one Massachusetts species has been suggested for federal listing as an endangered species.

#### Protocol for Selection of Priorities and Issuance of Contracts

Once research priorities and budget limitations have been determined, it is recommended that small contracts be initiated as soon as possible. This will facilitate the use of outside expertise, as needed. Thus, essential data on priority items can be acquired. At the outset of the Program, this approach may be far more cost-effective than adding full-time, highly specialized staff.

#### Research Priorities

Research priorities should be developed by the staff with Advisory Committee input. Research projects should be reviewed periodically in order to determine their relevance to current priorities.

#### Major Contracts

Major contracts should, in most cases, address critical needs and will possibly involve funds ranging between \$5,000 and \$20,000. They will require formal proposals which should include project significance, research objectives, time

budgets, financial budgets, curriculum vitae of principal investigator(s), and requirements for final reports. Proposals may be either unsolicited or the result of Requests for Proposals. It is recommended that, at the Assistant Director's discretion, the Nongame Advisory Committee review proposals or suggest reviewers.

#### Small Contracts

Small contracts will enable the Nongame Program to accomplish needed, but often relatively minor, projects as expeditiously as possible; individuals other than program personnel should be utilized. Size, accountability, duration, etc. should be determined within the first year. Selection of projects and administration of the contracts will be the responsibility of the Assistant Director. Principal investigators and contractors will be responsible for the supervision of their staff and successful completion of the project.

#### Requests for Proposals

RFP's should originate with Nongame Program staff and, with approval of the Assistant Director, be brought to the attention of individuals or organizations with demonstrated competence in the area of need.

#### Unsolicited Proposals

Unsolicited Proposals would follow the same protocol as with the contracts.

### III. Inventory of Animals, Plants and Communities

As noted above, species and community inventories provide the basis for successful Nongame projects and are necessary in order to determine the status and distribution of flora and fauna, especially those thought to be rare, threatened, or endangered. Such inventories become the data base to support management planning and priorities, land acquisition planning, consultations regarding environmental impacts, and efforts to inform the public concerning Nongame Wildlife.

Inventory must be recognized as a mandatory, ongoing activity that constantly forms and molds the direction of any wildlife program. Although a considerable data base has been developed, much more must be learned about the distribution of communities and species in the Commonwealth. In addition, continuing inventories will always be required to monitor the status of communities and species as the environment changes through time. Continued data accumulation is, therefore, the primary means of revealing and documenting changes in ecosystems. Problems thus realized can then be addressed by research and management processes.

#### Goals:

- \*To survey Nongame Wildlife (including invertebrates and plants) in order to determine distribution, abundance, and population trends
- \*To survey natural communities, particularly those which contain Species Listed for Special Consideration, in order to determine their distribution and status.

To continue monitoring Nongame Species and Communities for Special Consideration in order to be aware of any changes in their status.

#### ACTIVITIES

Since its beginning in 1973, the Division's Nongame Program has gathered data on nongame vertebrate species within the limits imposed by financial and personnel constraints. Individual species have been censused by Division personnel (e.g., great blue heron, bats and many fishes); other species have been studied through cooperative research with other organizations (e.g., mole salamanders, red-bellied turtle, loons, osprey, bald eagle, terns, and colonial water birds). In addition, there have been attempts to survey species present on Division properties. Based on these studies and on information from secondary sources (e.g. museum records, literature, naturalists) the Division published species lists of vertebrate groups known to occur in the state (APPENDIX D). The recent lists of vertebrates and native plants for Special Consideration were also published after review by the Nongame Advisory Committee.

Concurrent with these Division activities, the NHP began to assemble extensive data on the rare and endangered species in the Commonwealth, including vascular plants and some invertebrates as well as rare vertebrates. The information is stored in manual files which include natural history information and records of species occurrences (i.e. Element Occurrence). These records



are then marked on U.S.G.S. topographic maps and later entered into computer files. To date, this data base contains over 2200 Element Occurrences (APPENDIX C), over 1800 of which are in the computer. NHP has freely used the expertise of academic and amateur biologists in assembling their data base and has coordinated volunteer efforts to determine distribution of ambystomid salamanders.

The NHP has also begun to assemble data on selected natural communities. These data are stored in much the same way as the species Elements Occurrences but, due to personnel constraints, this effort has not progressed as far as the species segment of the data base.

## RECOMMENDATIONS

### General

- \*Data bases in the Division relevant to the Nongame Program should be merged into one
- \*Species inventory efforts should be focused on the continued development of a data base for plant, invertebrate, and vertebrate species thought to be rare, threatened, or endangered in Massachusetts. The data bases for invertebrates, birds, and mammals are in particular need of attention. The use of consultants and contractors can facilitate acquisition of data for poorly known taxonomic groups for which there is a need for specific expertise.
- \*Ecological community inventories should be given equal priority with species inventories. Community inventories

are necessary in order to: 1) assess the status and distribution of our varied natural communities, 2) document status of nongame species in the communities, and 3) educate the public about ecosystems and wildlife management. For the Nongame Program to be effective it must address ecological communities as well as single species.

Recommendations Regarding Data Base (manual, map, and computer files)

There is a backlog of data to be entered into the computerized data base. Access to this information is essential for program planning and decision-making. Although fairly extensive data exists for some groups (see APPENDIX C), there is critical need to expand other species files.

- \*The backlog of data should be substantially reduced during the first year. This would include continued updating of all existing files.
- \*Community Element Occurrences should be documented during the first year and should be entered into the data base on a high priority basis.
- \*The invertebrate data base should be expanded and a list of experts in various taxonomic groups should be compiled. Further, the Assistant Director should determine priorities for invertebrate inventories.
- \*Additional data are also needed for selected vertebrates, particularly small mammals and some birds. These data should be collected from all secondary sources (museums, literature, etc.) and entered into the data base.

### Recommendations Regarding Field Inventories and Other Research

The existing data base (APPENDIX C) illustrates that additional preliminary inventories and continued monitoring are needed. The lists of Species for Special Consideration are important documents that point out areas of interest and potential targets of management, research, and protection. Criteria and priorities will have to be established but, due to financial constraints and necessary planning, it is doubtful that extensive inventories can be conducted during the first year. Despite the budget and time constraints, every opportunity to accumulate data should be pursued.

- \*Inventories of Species and Communities for Special Consideration should be undertaken on the 60,000+ acres presently managed by the Division, including the 12 wildlife sanctuaries.
- \*Because contracts are the most cost-effective means of generating specialized data bases, a program of small contracts should be organized in order to fund inventories of communities and species particularly in areas where there is little or no in-house expertise.
- \*Preliminary field inventories of Species and Communities for Special Consideration for which there are very little data (e.g. bog turtle) should be conducted during the first year.
- \*The current Division and NHP vertebrate lists should be reviewed and merged, and their format and definitions

be revised during the first year. The new list should be published early in the second year.

\*A list of Invertebrates for Special Consideration should be outlined during the first year. Data supporting such a list could be generated by consultants and then compiled and written by staff during the second year.

\*The status of the Massachusetts Breeding Bird Atlas: 1974-1979 (joint project of Massachusetts Audubon Society and the Division) should be determined and the feasibility of publishing explored

#### Funding

It is recommended that high priority be given to establishment of a cooperative agreement with the Office of Endangered Species, USFWS, so that federal funds (i.e. Section 6 monies) can be used in Massachusetts for inventory, research, protection, and management of plant species which are federally listed as endangered or threatened or are Candidates for federal listing in the Commonwealth.



#### IV. Inventory, Acquisition, and Management of Lands

It is a basic premise of the Nongame and Endangered Species Program that the conservation of any species or subspecies depends upon the preservation of its habitat and associated natural communities.

##### Goals:

- To identify, evaluate, and recommend the acquisition and/or protection of Communities for Special Consideration
- To develop inventory and evaluation processes that will call attention to potentially adverse impacts on rare, threatened, and endangered species and critical habitats.
- To implement management practices that will insure the conservation of Species and Communities for Special Consideration

The Nongame and Endangered Species Program is currently involved with the conservation and protection of lands important to Species and Communities for Special Consideration. The Division's Natural Heritage Program provides the basic framework of land conservation. The Nongame Program's involvement, program needs, and recommendations are considered under the following headings: Protection Procedure, Protection Process, and Environmental Reviews. Progress on these elements should be reviewed periodically and modified as necessary.

##### Protection Procedure

Currently, the Natural Diversity Scorecard adopted by NHP is used to identify protection priorities for Species and Communities for Special Consideration (i.e. "threatened

ecological elements"). The Scorecard delineates the element, its rank (which prioritizes on the basis of rarity), its occurrence rank (which denotes the quality, viability and defensibility of the site), site name and ownership, current protection status, intended protection status, and allows for additional comments.

### Protection Process

This process provides criteria for selection of lands to be protected and the appropriate means of protection.

#### A. Identification of occurrence and distribution of Species and Communities for Special Consideration.

Some baseline data are currently available in the Division's NHP map and information files. Maintenance and expansion of these files are crucial to the Nongame and Endangered Species Program

#### B. Identification of land ownership

For selected, high priority species and communities, land ownership identification should continue to be determined by the NHP.

#### C. Selection of appropriate protection alternative(s)

##### 1. Landowner notification

Landowner notification is presently accomplished by the Nature Conservancy's Massachusetts Natural Areas Registry. The Registry involves private landowners only. NHP supplies the Nature Conservancy with information about high priority species and communities. NHP also notifies the

the Department of Environmental Management concerning selected species and communities on DEM properties. Private organizations requesting information also receive data concerning selected species and communities on their properties. Species and Communities for Special Consideration are emphasized in this program. The Division's Nongame Program needs to expand landowner notification to include all State EOE (Executive Office of Environmental Affairs) agencies and local governments.

2. Management agreements with landowners.

Currently, management agreements with landowners do not exist. Procedures and model management agreements need to be developed before this component of the Program is implemented.

3. Conservation restrictions by appropriate authorities.

Such restrictions do not exist presently. Procedures for determining appropriate restrictions and selecting authorities to implement them need to be developed.

4. Determination of acquisition priority.

- a. Presence of Species and Communities for Special Consideration
- b. Immediacy of threat
- c. Availability

Acquisition of lands must be decided on a case-by-case basis. Concern with habitat

management, presence of Species and Communities for Special Consideration, compatible human activities, and degree of threat are some of the considerations that must be made.

5. Acquisition

- a. Local government
- b. Private conservation organization
- c. Executive Office of Environmental Affairs  
(EOEA) agency (non-Division)
- d. Division of Fisheries and Wildlife
- e. Other

Environmental Reviews

These provide a mechanism for avoiding disturbance to sensitive areas (species and/or communities) and making appropriate recommendations).

- A. Environmental reviews are conducted by Massachusetts Environmental Policy Act (MEPA) Office, A95 Federal Consistency Review, Army Corps of Engineers, and Federal Energy Regulatory Commission (FERC). NHP reviews notices from these offices for potential impact on sites. Data requests to NHP also originate in Division of Conservation Services - (Town Open Space Plans), DEM, Department of Environmental Quality Engineering (DEQE), and environmental consulting companies.

Environmental review comments of NHP, regarding land development projects, provide information on presence of selected species and communities in order to notify



the project proponents so that disturbance to sensitive areas can be avoided. Environmental reviews and data requests are current activities of NHP and should continue. This is an important way in which the Division interacts with other agencies, broadens the Nongame and Endangered Species Program, and, generally, develops positive cooperative interdepartmental relationships.

B. Reviews of proposed land acquisitions for the occurrence of Species and Communities for Special Consideration

Currently, some land acquisitions by other agencies of the State EOEA are reviewed by NHP for the occurrence of rare and endangered species and communities. Eventually all lands containing natural habitats to be acquired by State agencies within EOEA and the Division should be reviewed by NHP for the occurrence of Species and Communities for Special Consideration.

#### RECOMMENDATIONS

- \*Distribution of Species and Communities for Special Consideration and land ownership identification should be compiled.
- \*The NHP should continue to supply information to and cooperate with the Nature Conservancy's Massachusetts Natural Areas Registry. The NHP should establish a procedure for landowner notification for all agencies of the State EOEA, local government agencies, and for all landowners not covered by the Massachusetts Natural Areas Registry. Efforts to identify

Species and Communities for Special Consideration on Division lands should continue.

- \*Ranking of lands, communities (using the Natural Diversity Scorecard) should continue in order to prioritize sites of Species and Communities for Special Consideration.
- \*Model management agreements and procedures for management agreements with landowners, other agencies, and private organizations should be developed.
- \*Procedures for selecting appropriate authorities to implement conservation restrictions should be determined and files established. Periodic follow-ups on restriction renewals should be conducted.
- \*Environmental reviews and responses to data requests should continue.
- \*Procedures should be developed for reviews of proposed land acquisition to determine occurrence of Species and Communities for Special Consideration for federal agencies and State EOEAs.
- \*With regard to lands proposed for acquisition, preference should be given to those containing Species and Communities for Special Consideration. Selected lands with unique habitats should be acquired with Capital Outlay funds and additional lands purchased as funds are available. Extent of habitat on such lands should be sufficient to support self-sustaining populations of priority ecological elements.

## V. Information and Education

The Nongame Program's functions of protection and management serve to benefit wildlife and plants and to enhance this resource for the aesthetic enjoyment of the Commonwealth's populace. The Division should disseminate various materials which will inform and educate the public so that it will become more aware of nongame wildlife and of programs which seek to protect and enhance these species and the communities of which they are part.

### Goals

- To enhance the public's perception of and appreciation for nongame wildlife and communities
- To heighten the public's awareness of the status of Species and Communities for Special Consideration
- To provide opportunities for the enjoyment of nongame wildlife while ensuring minimal detrimental impact on these living resource
- To inform the public of current events and achievements of the Program

### ACTIVITIES

Since the Nongame Bill (Chapter 330) was signed, the Division's section of Information and Education has focused on the following themes with regard to nongame wildlife: production and dissemination of general, specific, and scientific information and promotion of the Nongame Wildlife Fund including the income tax check-off.

The Division prepares and disseminates a variety of publications dealing, at least in part, with nongame (APPENDIX D). Foremost among these is "Massachusetts Wildlife" which regularly contains articles about nongame and is published when funds are available. Division personnel have prepared the Fauna of Massachusetts Series and Native Flora of Massachusetts Series. In addition, a pamphlet about wildlife sanctuaries has been produced, but only three species brochures (mole salamander, eagle, and chickadee) have been prepared (APPENDIX A). NHP has produced a variety of reports dealing with plants, invertebrates, vertebrates, communities, and hydrology as well as 58 plant and 17 animal Species Fact Sheets (APPENDIX E).

Since the Nongame Check-off Bill was signed, the Division produced and distributed posters, brochures, and cards which explained and advertised the income tax check-off to the general public, environmental organizations, legislators, and tax-form preparers. Recorded promotions, both short and long, have been provided to radio stations throughout the state. In addition, the Commissioner, Division personnel, and a Nongame Advisory Committee member (K. Anderson) have participated in interviews and/or talk shows. A video tape promotion has been made available to television stations; it has been aired throughout the Commonwealth. Further, public presentations about the Nongame Program have been made by the Assistant Director, NHP Coordinator and staff, State Ornithologist, and Nongame Advisory Committee members (M. Flor and G. S. Jones).



Slide programs on critical aspects of the Nongame Program are available and have been shown statewide, often in conjunction with other organizations--Nongame (an overview; 2 versions--10 and 28 minutes), Salamanders, Eagles, and Rare and Endangered Plants (NHP). In addition, a film about eagles is being prepared.

News releases are regularly sent to the media as are press packets about specific, major events. Both include appropriate nongame news.

Annual Salamander Survey Conferences are co-sponsored with other organizations in order to update and refine that ongoing project. Another example is the 2 April 1984 "Piping Plover-Least Tern Inventory/Protection/Management Workshop for Northeastern States" co-sponsored by the Division and the Nature Conservancy.

#### RECOMMENDATIONS

The following recommendations are specifically directed to promotion, education, and information dissemination. As many of these recommendations as possible should be implemented during the first year.

##### General

- \*Additional needs and priorities should be identified for interpretive and educational materials based on existing surveys of public attitudes and interests.

\*Groups and specialists interested in and involved with nongame wildlife should be identified and lists compiled (e.g. wildflower, bird, and sportsmen's clubs; conservation and environmental organizations; science centers; university, college, and secondary school faculty members; civic organizations; land owners, etc.). These should be kept informed and, when necessary, consulted.

#### Recommendations Regarding Promotion

- \*A month by month timetable of promotional activities should be developed (e.g. begin intensive promotion of checkoff in December) and utilized by the Division.
- \*The Division should compile a list of potential media consultants.
- \*Potential audiences for Information and Education services regarding nongame should be identified and added to the mailing list.
- \*A nongame wildlife calendar of seasonal events (e.g. bird migrations; salamander migrations; plant flowering) should be provided to the media and other interested audiences.
- \*Regular news releases should continue to include information specific to Nongame events and accomplishments, such as how Nongame monies have been spent.
- \*Wildlife "shorts" (PSA's) should be developed and made available to radio and television stations.
- \*Articles dealing with nongame wildlife should be provided to the print media on a regular schedule (e.g. monthly).

- \*A new promotional brochure should be developed which 1) defines nongame wildlife (listing some) and the Program, 2) explains the income tax checkoff, how to contribute to the fund, and how contributions will be used, and 3) lists some projects and accomplishments and available films, exhibits, and publications. The brochure should open into a poster with the Nongame Program's logo and a promotional statement for the checkoff and fund.
- \*Posters should be created which include such topics as backyard wildlife, urban wildlife, limestone wetland with bog turtle, showy ladyslipper, Boston Harbor birds, a collage of nongame mammals. Various forms should be created--general, for subway stations, subway cars and buses . . .
- \*Promotional items should be developed (e.g. bookmarks with logo and checkoff information similar to above brochure; nongame wildlife calendar; bumper and window stickers and cloth patches with logo and Program title).
- \*Urban and backyard habitats and open spaces should be emphasized as areas containing interesting and observable nongame species.
- \*The Division should sponsor an annual nongame conference to acquaint and involve interested lay people and professionals with the Program.
- \*Businesses should be encouraged to match employee contributions to the Nongame Fund.
- \*A request for contributions should be placed in each issue of "Massachusetts Wildlife."

- The front and back covers of the December issue of "Massachusetts Wildlife" should be photographs of the tax form, with the checkoff line highlighted. Articles in that issue should explain the checkoff and Program.
- A quarterly or biannual "Nongame Newsletter" should be considered as a means to describe and/or introduce the Nongame Program, checkoff, fund, staff, advisory committee, projects, results, and cooperative ventures. Species overviews including natural history, status, abundance, problems, strategies, and management information and requests for information and announcements of other organizations' programs could be included.
- A new logo should be developed which includes a plant, an invertebrate and a member of each vertebrate class in order to emphasize the SCOPE of the Program.
- A nongame photo contest should be instituted and prize winning photographs published in "Massachusetts Wildlife."

#### Recommendations Regarding Education

- The Division should develop either a loose leaf wildlife notebook series or soft cover books on plants, invertebrates, vertebrates and Communities for Special Consideration, which will contain common and scientific names, distribution map, color photograph, distinguishing characteristics, protection status, habitat requirements, life cycle information, abundance, decimating factors, management factors, and references.



These could be produced by Division biologists or, where appropriate, other experts. Such accounts would be edited by the Assistant Director and the I & E Office of The Division. This approach would encourage cooperative efforts, access to scientific/technical expertise and would distribute the work load. Funding for such a project in New Jersey was shared with USDA Soil Conservation Service. It is suggested that the Division explore such avenues of funding.

- \*More slide shows and films should be produced for specific groups as well as more for general audiences (e.g. flora of various sections of Massachusetts, selected species or groups such as bluebirds, reptiles, fishes). These would be made available on a loan basis to schools, science centers, sanctuaries, garden and wildflower clubs,
- \*The Division should encourage more public presentations about nongame wildlife and programs by Division biologists, and take advantage of the abundance of professionals in Massachusetts to present such talks. The Division has limited personnel. It should initiate and encourage such cooperative efforts. Lists of individuals and groups with expertise should be compiled in order to expedite this process.
- \*A map of the Commonwealth should be prepared illustrating selected areas for viewing nongame wildlife. Annotations, including tips for viewing and cautions, should accompany the map. The map could be distributed both separately and published in newspapers.

- \*The Division should sponsor seminars/conferences for professional biologists and ecologists and/or graduate students whose topics would relate to nongame subjects (e.g. status or management of particular species or communities).
- \*The Governor and General Court should be encouraged to proclaim a Nongame Wildlife Day or Week during which Division facilities would sponsor open houses, presentations, and field activities (e.g. eagle day, bluebird trails, osprey pole raising).

#### Recommendation Regarding Information Dissemination

- \*The Division should publish more data in state reports and/or published journals in order to disseminate information. This is the expression of accomplishment. The importance of publishing has been demonstrated in other states.

APPENDIX A. Wildlife Inventory and Management Projects, Nongame and  
Endangered Species Program, Division of Fisheries and  
Wildlife

Federally Endangered Species Projects:

- \*Red-bellied Turtle Study (1980-present)
- \*Indiana Bat Study (1978-present)
- \*Bald Eagle Re-introduction (1980-present)
- \*Mid-winter Bald Eagle Survey (1979-present)

Inventory and Management Projects

- \*Salamander Watch (1982-present)
- \*Bog Turtle Survey (low level 1982; 1984)
- \*Common Loon Management Program (1982-present)
- \*Great Blue Heron Rookery Inventory (1979-present)
- \*Osprey Nest Pole Installation Program (1981-present)
- \*Tern Colony Management Program (1977-present)
- \*Piping Plover Inventory Coordination (1983-present)
- \*Purple Martin Management (1981-present)
- \*Eastern Bluebird Management (low level 1977; 1984)
- \*Bird Inventory on Division Lands (1983-present)

## APPENDIX B. Current Research and Inventory Priorities of the Natural Heritage Program

### Natural Communities

Sandplain Grasslands. This ranks as one of the highest priorities for habitat protection in the state due to the concentration of rare species which occur here and the degree to which it is threatened. More than ten rare plant species are known from sandplain grasslands in Massachusetts, as well as the short-eared owl, northern harrier, upland sandpiper, grasshopper sparrow, regal fritillary butterfly. Restricted in range to southern New England and Long Island, N.Y., it is declining throughout. Short term research needs include inventories of the extent, quality, and species composition of existing sites. Long term research needs include ecological studies and determination of appropriate management techniques. Studies of management techniques might be coordinated with the Massachusetts Audubon Society's heathland project on Nantucket.

Coastal Plain Ponds. The exposed shores of Coastal Plain ponds support over twenty species of rare plants, one of which is being considered for federal listing. This natural community type also provides the bulk of the federally Endangered Plymouth red-bellied turtle's habitat. Nearly all of the Massachusetts Coastal Plain pond sites, which are the finest in the country, are threatened by development. Protection of these sites is a priority. Long term research needs include determination of the species' responses to water periodicity, study of seed viability through time, and examination of the effects of acidification and subsequent liming. Short term research needs are less important since most of inventory work has been done.

Calcareous Wetlands. Calcareous wetlands, including both forested and open community types, support many rare plant and animal species and are limited in distribution in the state. Short term research needs include inventories of the extent, quality, and species composition of existing occurrences. Long term study of the biological requirements of selected species and possible methods of habitat management are needed.

Tidal River Marshes. Good examples of this natural community type of brackish and freshwater tidal marshes, which supports both regionally and nationally rare plant species, are rare. Determination of locations, sizes, and quality, and inventories of species composition are needed.



## Plants

Small Whorled Pogonia (Isotria medeoloides). Only one site in the state is currently known for this species, which is listed as Endangered under the Endangered Species Act (ESA). Suitable habitat appears to be present in a large area near this site. Therefore, field work in this vicinity is urgently needed.

Sandplain Gerardia (Agalinis acuta). Formerly known from only twenty sites throughout its limited range, from eastern Massachusetts to Long Island, N. Y., this species is now known from only three sites in the world. This range restriction is due to habitat loss to development, wildfire suppression, and forest succession of open sandplain grassland habitats. Under the ESA, sandplain gerardia is a Category 1 candidate species which means it is a top priority for future listing. Research needs include seeking additional sites as well as studies to determine the species' microhabitat and management needs. The sandplain grassland habitat also supports an assemblage of other rare species (see above).

Chaffseed (Schwalbea americana). Historically known from seven sites in Massachusetts, this species has seriously declined from the northern part of its range, and is currently known from only three sites north of the Carolinas. There are no recent sites in Massachusetts; all former localities have been subject to habitat loss due to forest succession or development. Chaffseed is a category 2 candidate species under the ESA, meaning that more data is needed before active listing measures will proceed. Field inventory is needed, as well as review of secondary source material to determine habitat requirements and life history information.

## Animals

Small Mammals. Research is needed to determine the present distribution of several small mammal species thought to be rare in the state. Specifically, the population status, productivity, and habitat affinities of the southern bog lemming, water shrew, and long-tailed shrew need to be determined.

Grassland Birds. Large grassland areas that provide nesting habitat for upland sandpipers, Henslow's sparrows, grasshopper sparrows, short-eared owls, and northern harriers in Massachusetts are very limited in total extent, are largely threatened by development, and are in need of protection. All of these bird species are considered rare in the state. Population trends, habitat requirements, and factors limiting these birds need to be studied.

Wetland Birds. The present distribution and status in Massachusetts of rare wetland bird species such as the sedge wren, least bittern, American bittern, king rail, and pied-billed grebe need to be determined. Population trends, habitat requirements, and limiting factors need to be quantified.

Piping Plover. (Charadrius melodus). Piping Plovers are rare throughout the United States. Massachusetts has one of the larger state breeding populations of this beach nesting species. Annual monitoring of the status and productivity of known breeding colonies is needed as well as additional surveys to locate new colonies.

Timber Rattlesnake (Crotalus horridus). Timber rattlesnakes are currently known from five locations in the state. Formerly more common, the size of the present population is unknown. An inventory of known and suspected denning sites is necessary to determine the present status of this species in Massachusetts.

Regal Fritillary (Speyeria idalia). The regal fritillary butterfly has declined drastically throughout the northeastern United States in the last thirty years. In fact, in New England it is now considered to be extirpated from the mainland. Additional populations need to be located and research should be conducted on the population size and habitat requirements of the known populations in the state. Investigations into methods of habitat management including controlled burning is also needed.

Tiger Beetles (Cicindela spp.). Tiger beetles are quite habitat-specific and quite extinction prone. Certain of the dozen plus species that occur in Massachusetts are thought to be extremely rare and at least one species (C. dorsalis) may be extinct. An inventory of the distribution, habitat requirements, and status in the state of species of Cicindela is urgently needed.

APPENDIX C. Status of Element Occurrence Data Base (15 March 1984)

<u>Type of Element</u>	<u># of Elements</u>	<u>Occurrences Mapped</u>	<u>Occurrences Computerized</u>	<u>Information in Element File Abstracts / Fact Sheets</u>
ANIMALS				
Vertebrates				
Mammals	12	27	25	7 2
Birds	44	112	55	6 6
Reptiles	12	89	88	3 2
Amphibians	7	169	159	4 4
Fish	10	26	11	1 1
Invertebrates				
Macrolepidoptera	72	5	0	61 2
Selected freshwater species	9	8	5	2 0
SUBTOTAL	166	436(+92*)	343	84 17
VASCULAR PLANTS	250	1651(+522*)	1384	35 58
NATURAL COMMUNITIES	ca 100	39	16	2
AQUATIC FEATURES**			31	
OTHER***	<u>4</u>	<u>88</u>	<u>82</u>	<u>      </u>
TOTALS	520	2214	1856	121 75

\*unmappables

\*\*to be revised and combined with Natural Communities

\*\*\*includes breeding bird colonies, non-breeding bird concentrations, bat hibernacula

Note: total # of occurrences computerized as of April 9, 1984: 1925



APPENDIX D. Publications and Reports pertinent to Nongame Wildlife Program, published by Division of Fisheries and Wildlife

Massachusetts Wildlife (magazine)

Fauna of Massachusetts Series

Cardoza, J. E. 1979. List of the mammals of Massachusetts. 2nd ed., 2: 9pp.

Cardoza, J. E. and P. G. Mirick. 1979. List of the reptiles and amphibians of Massachusetts. 3: 5pp.

Halliwell, D. B. 1981. A list of the freshwater fishes of Massachusetts. 2nd ed., 4: 12pp.

Blodgett, B. G. and J. E. Cardoza. 1982. Nongame wildlife for special consideration in Massachusetts., 2nd ed., 11pp.

Blodgett, B. G. 1983. List of the birds of Massachusetts. 3rd ed., 1: 24pp.

Native Flora of Massachusetts Series

Sorrie, B. A. 1983. Native plants for special consideration in Massachusetts., 1: 12pp.

Komins, M. W. 1979. Wildlife sanctuaries., 47pp.  
(and Regulations for Wildlife Sanctuaries)

Pond Map Series (mimeo)  
(and list of Maps of Ponds - mimeo)  
(and Index to Pond Map Booklets)

Species Brochures

Anon. The Bald Eagle in Massachusetts.

Anon. The Chickadee

Anon. Mole Salamander



APPENDIX E. Publications and Reports, Natural Heritage Program,  
Division of Fisheries and Wildlife

Anon. 1982. User's guide., 9pp.

Anon. 1982. Salamander Survey., 44pp. (out of print)

New England Natural Diversity Workshop (abstracts). sponsored by  
Massachusetts Natural Heritage Program, Mt. Holyoke College,  
S. Hadley, Mass., 24 April 1982. (out of print)

Harding, J. 1983. Rare animal species in Massachusetts., 13pp. (mimeo)

Schweitzer, D. F. 1983. A rare Lepidoptera inventory for  
Massachusetts--Final Summary Report. 21pp (mimeo) (out of print)

Theall, O. 1983. An investigation into the hydrology of Massachusetts  
coastal plain ponds., 35pp. (out of print)

Anon. 1984. Species fact sheets. (58 plants, 17 animals)





